PATENT ABSTRACTS OF JAPAN

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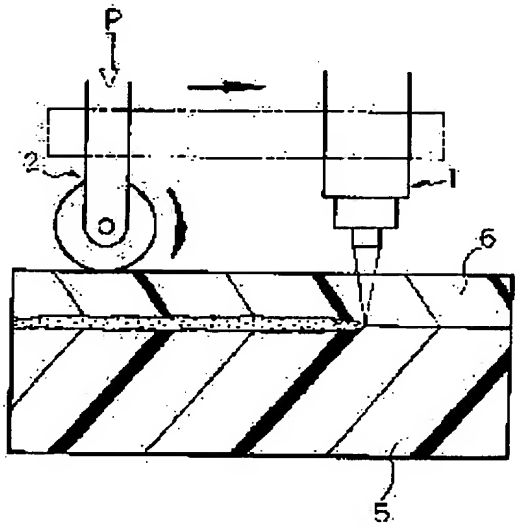
(54) METHOD FOR WELDING THERMOPLASTIC SYNTHETIC RESIN MEMBER BY LASER BEAM

(57)Abstract:
PROBLEM TO BE SOLVED: To bond thermoplastic synthetic resin members to each other by irradiation with laser beams.
SOLUTION: A bonding method by laser beams includes a process in which a transparent member 6 which is made of a thermoplastic synthetic resin and transmits prescribed laser beams is contacted with the end surface of an opaque member 5 which is made of a thermoplastic synthetic resin and transmits prescribed laser beams, a process in which a part where the transparent member 6 contacts the opaque member 5 is irradiated with laser beams to make the focus coincide from the transparent member 6 side with the use of a laser torch 1 which emits prescribed laser beams, and a process in which after the irradiation of laser beams, in the state of the contact part of the resin members 5, 6 and its periphery being softened, the resin members 5, 6 are pressed with a prescribed press means 2.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] What [consists of a body which consists of thermoplastic synthetic resin and penetrates a predetermined laser beam] (henceforth a transparence member) What consists of a body which consists of thermoplastic synthetic resin and absorbs a predetermined laser beam at the place of the edge (henceforth an opaque member) is contacted. After an appropriate time, a predetermined laser beam from the above-mentioned transparence member side at the place where the above-mentioned transparence member and an opaque member touch In the condition that irradiate so that the focus may agree, and the circumference of the contact section of the above-mentioned member made of both thermoplasticity synthetic resin came to be tinctured with flexibility after still such an exposure of a laser beam The joining approach by the laser beam of the member made of thermoplastic synthetic resin characterized by consisting of a process it was made to stick between these both by pressure with a predetermined means.
[Claim 2] The joining approach by the laser beam of the member made of thermoplastic synthetic resin characterized by setting the location of the focus of the above-mentioned laser beam as the place which advanced to the specified quantity above-mentioned opaque member side rather than the contact surface of a transparence member and an opaque member, or these contact surfaces in the joining approach by the laser beam of the member made of thermoplastic synthetic resin according to claim 1.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the joining approach of the member which consists of thermoplastic synthetic resin to which the members made of thermoplastic synthetic resin are joined, and to which it was made to join both simply and efficiently especially about the approach using a predetermined laser beam not using adhesives etc.
[0002]
[Description of the Prior Art] It is common to be formed by the 2 quality-of-the-material shaping approach of dividing into 2 times the plastics material which junction of the conventional members made from plastics, for example, junction of the members 10 and 20 which have a different property as shown in drawing 3 , is performed through adhesives 30 grade in between, or has two different descriptions, and performing injection etc.
[0003]
[Problem(s) to be Solved by the Invention] By the way, since the above-mentioned conventional approach, for example, the approach by adhesives, is what is depended on an operator's handicraft, it serves as an inefficient activity. Moreover, there is a trouble referred to as being unable to obtain stable bonding strength. On the other hand, in the injection means by the 2 quality-of-the-material shaping approach, outside it requires two or more dice, a mold with a special slide mold etc. is needed. Moreover, the cycle time for injection is prolonged and there is a trouble said that productivity is inferior. In order to solve such a trouble, while making one thing consist of a transparence member among two plastics material, it is the purpose (technical problem) of this invention by making the thing of remaining another side consist of an opaque member, and irradiating a predetermined laser beam at these contact sections that it is going to offer the joining approach by the laser beam of the member made from plastics to which it was made to carry out joining of both.
[0004]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, we decided to adopt the following means in this invention. Namely, the thing (transparence member) which consists of a body which consists of a member made of thermoplastic synthetic resin, and penetrates a predetermined laser beam about the junction approach of the members made from plastics, In the process at which what consists of a body which consists of a member made of thermoplastic synthetic resin, and absorbs a predetermined laser beam at the place of the edge (opaque member) is contacted, and such a condition The process which irradiates a predetermined laser beam from the above-mentioned transparence member side so that the focus may agree at the touching place of the transparence member concerned and the above-mentioned opaque member, the process which sticks between these both by pressure with a predetermined means in the condition of the circumference of the contact section of the above-mentioned member made of both thermoplasticity synthetic resin fusing after such an exposure of a laser beam, and having come to be tinctured with flexibility -- since -- it was made to become
[0005] By taking such a process, junction of the member made from plastics which has two different descriptions will be efficiently performed in the thing of this invention. Moreover, both the members joined by these joining approaches will be combined firmly (junction). Namely, when based on the conventional adhesion approach, it sets. Prepare adhesives or a double faced adhesive tape in the end face of one member, and it sets to the thing of this invention to trying to paste up from it, other members, for example, flexible-plastics material etc., etc. For example, making a predetermined laser beam irradiate the contact surface, as shown in drawing 1 , immediately, since it is made to carry out the pressure welding of both with a

predetermined sticking-by-pressure means, these junction activity will be efficiently done by a series of activities in the place where these contact surfaces changed into the melting condition. Moreover, once it sets the activity of these single strings by controlling using an automatic-control means etc., after that, a junction activity will be done automatically and it can attain full automation or laborsaving of an activity. Moreover, compared with the 2 quality-of-the-material shaping approach, use of a slide mold and two injection activities become unnecessary, and improvement in productivity and reduction-ization of a production cost can be attained now.

[0006] Next, invention according to claim 2 is explained. This thing of that fundamental point is the same as that of the thing of the claim 1 above-mentioned publication. The place by which it is characterized [the] is having set the focal location of the above-mentioned laser beam as the place which advanced to the specified quantity above-mentioned opaque member side rather than the contact surface of a transparence member and an opaque member, or these contact surfaces in the joining approach by the laser beam of the member made of thermoplastic synthetic resin. Thus, by moving a focal location to an opaque member side, the energy concentration section by the laser beam will be formed in the condition with a certain amount of area, and the welding between both members will have predetermined width of face, and will be formed. Consequently, a powerful joint can be formed now.

[0007]

[Embodiment of the Invention] The gestalt of operation of this invention is explained based on drawing 1 R> 1 and drawing 2 . Although related with the gestalt of operation of this invention, the contents The member 5 made of thermoplastic synthetic resin (opaque member) which consists of the opaque body which absorbs a predetermined laser beam as shown in drawing 1 , While piling up the member 6 made of thermoplastic synthetic resin (transparence member) which consists of the transparent body which makes a predetermined laser beam penetrate at the place of the end face The process which irradiates the above-mentioned laser beam with the laser torch 1 which emits a predetermined laser beam at the place of the above-mentioned superposition section, When it is prepared in the back section of the laser torch 1 concerned, the circumference of the contact section of the members 5 and 6 made of both thermoplasticity synthetic resin changes into a melting condition by the exposure of the laser beam from the above-mentioned laser torch 1 and it becomes soft the sticking-by-pressure process which sticks by pressure the place concerned which became soft with a predetermined pressure (P) -- since -- it is based on becoming. And as shown in drawing 1 , the laser torch 1 and the sticking-by-pressure means 2 which bear each [these] process are in the condition used as a pair (lot), for example, move in the direction of an arrow head in the place which two members 5 and 6 made of thermoplastic synthetic resin piled up. And still such a series of joining processes are performed continuously.

[0008] Next, a predetermined laser beam is irradiated among those which form such each process, and the laser radiation means which bears the process to which melting of the place of the superposition section of the members 5 and 6 made of both thermoplasticity synthetic resin is carried out consists of a laser torch 1 which mainly discharges an YAG laser, as shown in drawing 2 . And as shown in drawing 2 , while such an YAG laser is irradiated from the member (transparence member) 6 side made of the thermoplastic synthetic resin which consists of the transparent body, as for the exposure wave (laser beam), the focus is together put on the basis of the superposition section of the members 5 and 6 made of both thermoplasticity synthetic resin. And as for the member 5 made of thermoplastic synthetic resin, the contact surface is formed with the opaque body [in / such the superposition section (contact section)] which absorbs a laser beam. In addition, as this opaque body (opaque member), although mainly based on black, as long as it seems that it is not limited black, YAG laser light is absorbed [this] well, and efficient generation of heat accomplishes especially, any color is sufficient. In addition, it is in the condition which inclined toward the opaque member 5 side rather than it on the basis of the above-mentioned superposition section about the above-mentioned focal location, and it is desirable that the focusing accomplishes. Specifically, a focal location is suitably set to the above-mentioned opaque member 5 side from the above-mentioned superposition section within 2mm thru/or limits which progressed 10mm. Thus, where it has a certain amount of area (width of face), the energy-absorbing section of a laser beam can be formed now, and a welding can be made to form by this, by shifting a focal location from the contact surface (superposition section), where it has fixed width of face now.

[0009] Moreover, as what forms the transparence member 6 among the members made of thermoplastic synthetic resin with which such junction is presented, the hydrogenation object (SEBS) of polyethylene (PE), polypropylene (PP), a polyvinyl chloride (PVC), ethylene propylene rubber, a styrene-butadiene block copolymer (SBR), or a styrene-butadiene block copolymer etc. is desirable. Moreover, as what forms the

opaque member 5, polypropylene (PP) or ABS plastics is desirable.
[0010] Next, the sticking-by-pressure process which is performed in such a laser beam exposure process and a pair of condition, and is performed as a back process from the back of a laser beam exposure process As shown in drawing 1 , with the sticking-by-pressure means 2 which consists of a roller etc., it fuses by the exposure of the above-mentioned laser beam, and it has a predetermined pressure (P) and the place of the superposition section (contact section) of the members 5 and 6 made of both thermoplasticity synthetic resin in the condition of having become soft is forced. And this sticking-by-pressure process is formed with a sticking-by-pressure means 2 to operate united with the laser torch 1 which irradiates a laser beam, as shown in drawing 1 . Therefore, in the gestalt of this operation, the above-mentioned laser beam exposure process and a sticking-by-pressure process will have predetermined spacing, and will be advanced continuously, and the increase in efficiency of a joining process will be attained.
[0011] Next, the operation about the thing of the gestalt of this operation which consists of such a process etc. is explained. In the thing of the gestalt of this operation, junction of the members 5 and 6 made of thermoplastic synthetic resin which have two different descriptions will be performed efficiently. Moreover, both the members 5 and 6 which were joined by these joining approaches will be combined firmly (junction). Namely, when based on the conventional adhesion approach, it sets. As opposed to preparing adhesives or a double faced adhesive tape in the end face of one member, and trying to paste up from it, other members, for example, flexible-plastics material etc., etc. In the place where these contact surfaces changed into the melting condition, making a predetermined laser beam irradiate the contact surface in the thing of the gestalt of this operation, as shown, for example in drawing 1 Immediately, since it is made to carry out the pressure welding of both with the predetermined sticking-by-pressure means 2, these junction activity will be efficiently done by a series of activities. Moreover, the activity of these single strings can come to be efficiently done by an automatic-control means etc., and can attain now full automation or laborsaving of an activity. Moreover, compared with the 2 quality-of-the-material shaping approach, use of a slide mold and two injection activities become unnecessary, and improvement in productivity and reduction-ization of a production cost can be attained now.
[0012]
[Effect of the Invention] The opaque member which consists of a body which according to this invention consists of a member made of thermoplastic synthetic resin, and absorbs a predetermined laser beam about the junction approach of the members made from plastics, In the process at which the transparence member which consists of a body which it consists [body] of a member made of thermoplastic synthetic resin, and makes a predetermined laser beam penetrate at the place of the edge is contacted, and such a condition The process which irradiates a predetermined laser beam from the above-mentioned transparence member side so that the focus may agree at the place where the above-mentioned transparence member and an opaque member touch, the process which sticks between these both by pressure with a predetermined means in the condition of the circumference of the contact section of the above-mentioned member made of both thermoplasticity synthetic resin fusing, and having come to be tinctured with flexibility after such an exposure of a laser beam -- since, since it was made to become Junction of the members made of thermoplastic synthetic resin which have two different descriptions came to be performed efficiently. Moreover, both [these] members can be firmly combined now (junction).
[0013] Namely, when based on the conventional adhesion approach, it sets. Prepare adhesives or a double faced adhesive tape in the end face of one member, and it sets to the thing of this invention to trying to paste up from it, other members, for example, flexible-plastics material etc., etc. Making a predetermined laser beam irradiate the contact surface, immediately, since it was made to carry out the pressure welding of both with a predetermined sticking-by-pressure means, these junction activities could be efficiently done by a series of activities in the place where these contact surfaces changed into the melting condition. Moreover, once it set by controlling the activity of these single strings by an automatic-control means etc., after that, a junction activity can be automatically done now, and full automation or laborsaving of an activity could be attained. Moreover, compared with the 2 quality-of-the-material shaping approach, use of a slide mold and two injection activities become unnecessary, and improvement in productivity and reduction-ization of a production cost can be attained now.

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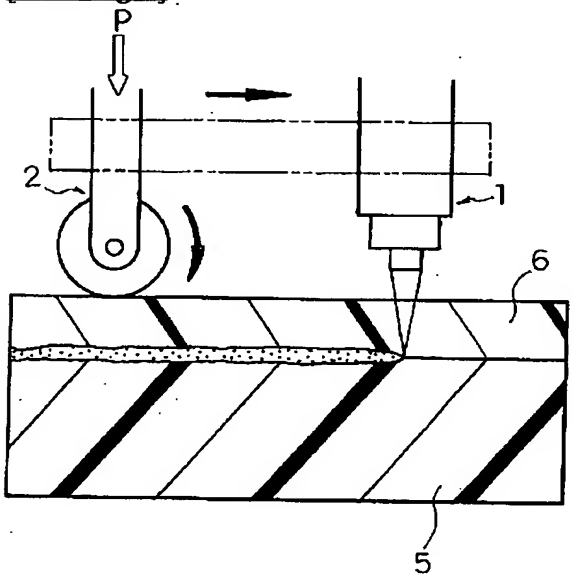
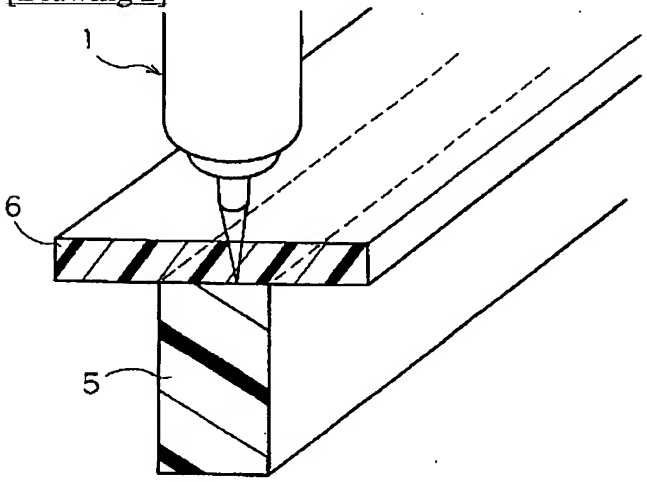
DRAWINGS

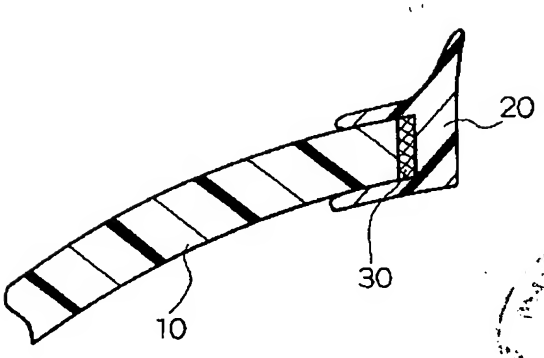
[Drawing 1]



[Drawing 2]



[Drawing 3]



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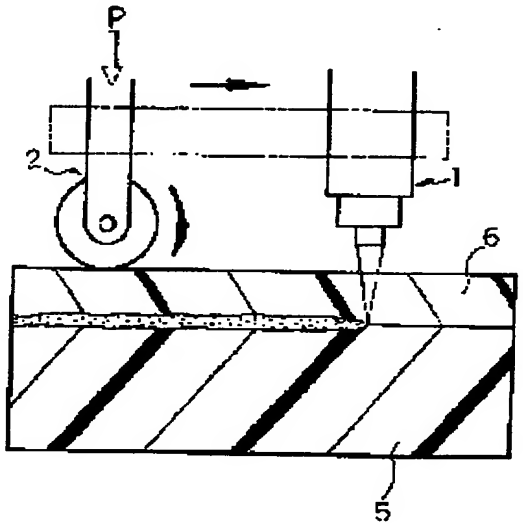
PROBLEM TO BE SOLVED: To bond thermoplastic synthetic resin members to each other by irradiation with laser beams.
SOLUTION: A bonding method by laser beams includes a process in which a transparent member 6 which is made of a thermoplastic synthetic resin and transmits prescribed laser beams is contacted with the end surface of an opaque member 5 which is made of a thermoplastic synthetic resin and transmits prescribed laser beams, a process in which a part where the transparent member 6 contacts the opaque member 5 is irradiated with laser beams to make the focus coincide from the transparent member 6 side with the use of a laser torch 1 which emits prescribed laser beams, and a process in which after the irradiation of laser beams, in the state of the contact part of the resin members 5, 6 and its periphery being softened, the resin members 5, 6 are pressed with a prescribed press means 2.



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			３１０Ｗ
26/04		26/04	Ｚ

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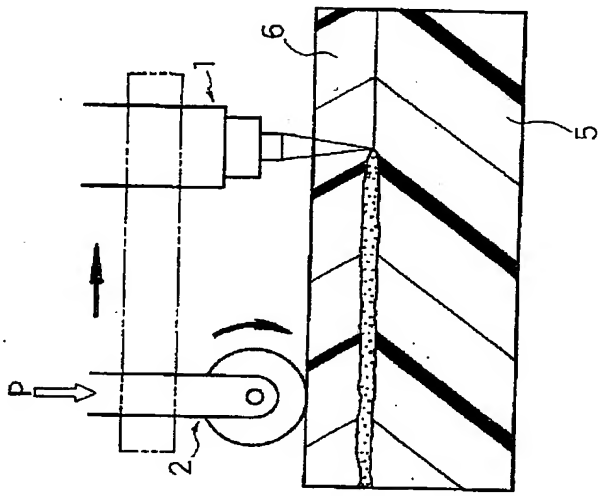
(54)【発明の名称】　熱可塑性合成樹脂製部材のレーザ光による溶着方法

(57)【要約】

【課題】　レーザ光の照射にて熱可塑性合成樹脂製部材どうしを接合させる。

【解決手段】　その接合方法を、熱可塑性合成樹脂からなるものであって所定のレーザ光を吸収する不透明部材５の、その端面のところに、熱可塑性合成樹脂からなるものであって所定のレーザ光を透過させる透明部材６を接触させる工程と、このような状態において、上記透明部材６側から、所定のレーザ光を発射するレーザトーチ１を用いて、上記透明部材６と不透明部材５とが接するところに、その焦点が合致するようにレーザ光の照射をする工程と、このようなレーザ光の照射の後、上記両熱可塑性合成樹脂製部材５、６の接触部周りが溶融して柔軟性を帯びるようになった状態において、これら両者の間を所定の圧着手段２にて圧着する工程と、からなるようにする。



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【特許請求の範囲】

【請求項１】　熱可塑性合成樹脂からなるものであって所定のレーザ光を透過する物体からなるもの（以下透明部材という）の、その端部のところに、熱可塑性合成樹脂からなるものであって所定のレーザ光を吸収する物体からなるもの（以下不透明部材という）を接触させ、しかる後に、上記透明部材側から所定のレーザ光を、上記透明部材と不透明部材とが接するところに、その焦点が合致するように照射し、更に、このようなレーザ光の照射の後、上記両熱可塑性合成樹脂製部材の接触部周りが柔軟性を帯びるようになった状態において、これら両者の間を所定の手段にて圧着するようにした工程からなることを特徴とする熱可塑性合成樹脂製部材のレーザ光による溶着方法。

【請求項２】　請求項１記載の熱可塑性合成樹脂製部材のレーザ光による溶着方法において、上記レーザ光の焦点の位置を、透明部材と不透明部材との接触面、または、これら接触面よりも、所定量上記不透明部材側へ進入したところに設定するようにしたことを特徴とする熱可塑性合成樹脂製部材のレーザ光による溶着方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、熱可塑性合成樹脂製部材どうしを接合させる、その方法に関するものであり、特に、接着剤等を用いず、所定のレーザ光を用いて、簡単に、かつ、効率良く両者を接合させるようにした熱可塑性合成樹脂からなる部材の溶着方法に関するものである。

【０００２】

【従来の技術】従来のプラスチック製部材どうしの接合、例えば、図３に示すような異なった性質を有する部材どうし１０、２０の接合は、間に接着剤３０等を介して行なわれるか、または、二つの異なった性状を有するプラスチック材を２度に分けてインジェクションを行なう二材質成形方法等にて形成されるのが一般的である。

【０００３】

【発明が解決しようとする課題】ところで、上記従来の方法、例えば接着剤による方法は、作業者の手作業によるものであるため、非効率的な作業となる。また、安定的な接合強度を得ることができないと言う問題点がある。一方、二材質成形方法によるインジェクション手段においては、複数の成形型を要する外に、スライド型等の特別な型を必要とする。また、インジェクションのためのサイクルタイムが延び、生産性が劣ると言う問題点がある。このような問題点を解決するために、二つのプラスチック材のうち、一方のものを透明部材からなるようにするとともに、残りの他方のものを不透明部材からなるようにし、これらの接触部に所定のレーザ光を照射することによって、両者を溶着させるようにしたプラスチック製部材のレーザ光による溶着方法を提供しようとするのが、本発明の目的（課題）である。

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【０００４】

【課題を解決するための手段】上記課題を解決するために、本発明においては次のような手段を講ずることとした。すなわち、プラスチック製部材どうしの接合方法に関して、熱可塑性合成樹脂製部材からなるものであって所定のレーザ光を透過する物体からなるもの（透明部材）の、その端部のところに、熱可塑性合成樹脂製部材からなるものであって所定のレーザ光を吸収する物体からなるもの（不透明部材）を接触させる工程と、このような状態において、上記透明部材側から所定のレーザ光を、当該透明部材と上記不透明部材との接するところに、その焦点が合致するように照射する工程と、このようなレーザ光の照射の後、上記両熱可塑性合成樹脂製部材の接触部周りが溶融して、柔軟性を帯びるようになった状態において、これら両者の間を所定の手段にて圧着する工程と、からなるようにした。

【０００５】このような工程を採ることにより、本発明のものにおいては、二つの異なった性状を有するプラスチック製部材の接合が効率良く行なわれることとなる。また、これらの溶着方法にて接合された両部材どうしは、強固に結合（接合）されることとなる。すなわち、従来の接着方法による場合等においては、一方の部材の端面に接着剤あるいは両面接着テープ等を設け、その上から他の部材、例えば軟質プラスチック材等を接着するようにしているのに対して、本発明のものにおいては、例えば図１に示す如く、所定のレーザ光を接触面に照射させながら、これら接触面が溶融状態となったところで、直ちに、所定の圧着手段にて、両者を圧接するようにしているので、これら接合作業が一連の作業にて効率良く行なわれることとなる。また、これら一連の作業は自動制御手段等を用いて制御することによって、一度セットすれば、後は自動的に接合作業が進められることとなり、作業の無人化あるいは省力化を図ることができるようになる。また、二材質成形方法に較べて、スライド型の使用や、２度のインジェクション作業が不要となり、生産性の向上及び生産コストの低減化を図ることができるようになる。

【０００６】次に、請求項２記載の発明について説明する。このものも、その基本的な点は上記請求項１記載のものと同じである。その特徴とするところは、熱可塑性合成樹脂製部材のレーザ光による溶着方法において、上記レーザ光の焦点位置を、透明部材と不透明部材との接触面、または、これら接触面よりも、所定量上記不透明部材側へ進入したところに設定するようにしたことである。このように焦点位置を不透明部材側へ移動させることによって、レーザ光によるエネルギー集中部が、ある程度の面積を有した状態で形成されることとなり、両部材間における溶着部が、所定の幅をもって形成されることとなる。その結果、強力な接合部を形成することがで

きるようになる。

【０００７】

【発明の実施の形態】本発明の実施の形態について、図１及び図２を基に説明する。本発明の実施の形態に関するものの、その内容は、図１に示す如く、所定のレーザ光を吸収する不透明体からなる熱可塑性合成樹脂製の部材（不透明部材）５の、その端面のところに、所定のレーザ光を透過させる透明体からなる熱可塑性合成樹脂製の部材（透明部材）６を重ね合わせるとともに、所定のレーザ光を発するレーザトーチ１をもって上記重ね合わせ部のところに上記レーザ光を照射する工程と、当該レーザトーチ１の後方部に設けられるものであって、上記レーザトーチ１からのレーザ光の照射によって両熱可塑性合成樹脂製部材５、６の接触部周りが溶融状態となり柔らかくなったときに、当該柔らかくなったところを所定の圧力（Ｐ）をもって圧着する圧着工程と、からなることを基本とするものである。そして、これら各工程を担うレーザトーチ１及び圧着手段２が、図１に示す如く、二つの熱可塑性合成樹脂製部材５、６の重ね合わされたところを、対（一組）となった状態で、例えば矢印方向に移動するようになっているものである。そして更に、このような一連の溶着工程が連続的に行なわれるようになっているものである。

【０００８】次に、このような各工程を形成するもののうち、所定のレーザ光を照射し、両熱可塑性合成樹脂製部材５、６の重ね合わせ部のところを溶融させる工程を担うレーザ照射手段は、図２に示す如く、主にＹＡＧレーザを発射するレーザトーチ１からなるものである。そして、このようなＹＡＧレーザは、図２に示す如く、透明体からなる熱可塑性合成樹脂製の部材（透明部材）６側から照射されるとともに、その照射波（レーザ光）は、両熱可塑性合成樹脂製部材５、６の重ね合わせ部を基準にして、その焦点が合わされるようになっているものである。そして、このような重ね合わせ部（接触部）における一方の熱可塑性合成樹脂製部材５は、その接触面がレーザ光を吸収する不透明体にて形成されるようになっているものである。なお、この不透明体（不透明部材）としては、主に黒色を基本とするものであるが、特に、この黒色に限定されるものではなく、ＹＡＧレーザ光を良く吸収して、効率的な発熱が成されるようなものであれば何色でも良い。なお、上記焦点位置に関しては、上記重ね合わせ部を基準にして、それよりも不透明部材５側に偏った状態で、その焦点合わせが成されるのが好ましい。具体的には、上記重ね合わせ部から、上記不透明部材５側へ２㎜ないし１０㎜進んだ範囲内で、適宜焦点位置が設定されるようになっているものである。このように、焦点位置を接触面（重ね合わせ部）からずらすことによって、ある程度の面積（幅）をもった状態でレーザ光のエネルギー吸収部を形成することができるようになり、これによって、溶着部を一定の幅をもった状態で形成させることができるようになる。

【０００９】また、このような接合に供せられる熱可塑性合成樹脂製部材のうち透明部材６を形成するものとしては、ポリエチレン（ＰＥ）、ポリプロピレン（ＰＰ）、ポリ塩化ビニール（ＰＶＣ）、エチレン－プロピレン共重合体、スチレン－ブタジエンブロック共重合体（ＳＢＲ）、あるいはスチレン－ブタジエンブロック共重合体の水素添加物（ＳＥＢＳ）等が好ましい。また、不透明部材５を形成するものとしては、ポリプロピレン（ＰＰ）、または、ＡＢＳ樹脂等が好ましい。

【００１０】次に、このようなレーザ光照射工程と対の状態で行なわれるものであって、レーザ光照射工程の後方から、後工程として行なわれる圧着工程は、図１に示す如く、ローラ等からなる圧着手段２にて、上記レーザ光の照射により溶融し、柔らかくなった状態の両熱可塑性合成樹脂製部材５、６の重ね合わせ部（接触部）のところを、所定の圧力（Ｐ）をもって押し付けるようになっているものである。そして、この圧着工程は、図１に示す如く、レーザ光を照射するレーザトーチ１と一体となって作動する圧着手段２にて形成されるようになっているものである。従って、本実施の形態においては、上記レーザ光照射工程と圧着工程とが、所定の間隔をもって連続的に進められることとなり、溶着工程の効率化が図られることとなる。

【００１１】次に、このような工程からなる本実施の形態のものについての、その作用等について説明する。本実施の形態のものにおいては、二つの異なった性状を有する熱可塑性合成樹脂製部材５、６の接合が効率良く行なわれることとなる。また、これらの溶着方法にて接合された両部材５、６どうしは、強固に結合（接合）されることとなる。すなわち、従来の接着方法による場合等においては、一方の部材の端面に接着剤あるいは両面接着テープ等を設け、その上から他の部材、例えば軟質プラスチック材等を接着するようにしているのに対して、本実施の形態のものにおいては、例えば図１に示す如く、所定のレーザ光を接触面に照射させながら、これらの接触面が溶融状態となったところで、直ちに、所定の圧着手段２にて、両者を圧接するようにしているので、これら接合作業が一連の作業にて効率良く行なわれることとなる。また、これら一連の作業は、自動制御手段等により効率良く進められるようになり、作業の無人化あるいは省力化を図ることができるようになる。また、二材質成形方法に較べて、スライド型の使用や、２度のインジェクション作業が不要となり、生産性の向上及び生産コストの低減化を図ることができるようになる。

【００１２】

【発明の効果】本発明によれば、プラスチック製部材どうしの接合方法に関して、熱可塑性合成樹脂製部材からなるものであって所定のレーザ光を吸収する物体からなる不透明部材の、その端部のところに、熱可塑性合成樹

脂製部材からなるものであって所定のレーザ光を透過させる物体からなる透明部材を接触させる工程と、このような状態において、上記透明部材側から所定のレーザ光を、上記透明部材と不透明部材とが接するところに、その焦点が合致するように照射する工程と、このようなレーザ光の照射の後、上記両熱可塑性合成樹脂製部材の接触部周りが溶融して柔軟性を帯びるようになった状態において、これら両者の間を所定の手段にて圧着する工程と、からなるようにしたので、二つの異なった性状を有する熱可塑性合成樹脂製部材どうしの接合が効率良く行なわれるようになった。また、これら両部材どうしを強固に結合（接合）させることができるようになった。

【００１３】すなわち、従来の接着方法による場合等においては、一方の部材の端面に接着剤あるいは両面接着テープ等を設け、その上から他の部材、例えば軟質プラスチック材等を接着するようにしているのに対して、本発明のものにおいては、所定のレーザ光を接触面に照射させながら、これら接触面が溶融状態となったところで、直ちに、所定の圧着手段にて、両者を圧接するようにしたので、これらの接合作業を一連の作業にて効率良＊く行なうことができるようになった。また、これら一連の作業を自動制御手段等にて制御することによって、一度セットすれば、後は自動的に接合作業を進めることができるようになり、作業の無人化あるいは省力化を図ることができるようになった。また、二材質成形方法に較べて、スライド型の使用や、２度のインジェクション作業が不要となり、生産性の向上及び生産コストの低減化を図ることができるようになった。

【図面の簡単な説明】

【図１】本発明の全体構成を示す図である。

【図２】本発明の主要部を成すレーザ光照射工程を示す図である。

【図３】従来の工程である接着工程にて形成された接合部の構造を示す断面図である。

【符号の説明】

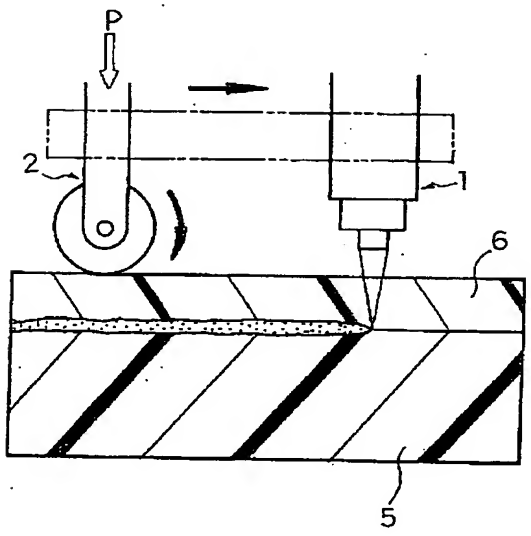
1　レーザトーチ（レーザ光照射手段）

2　圧着手段

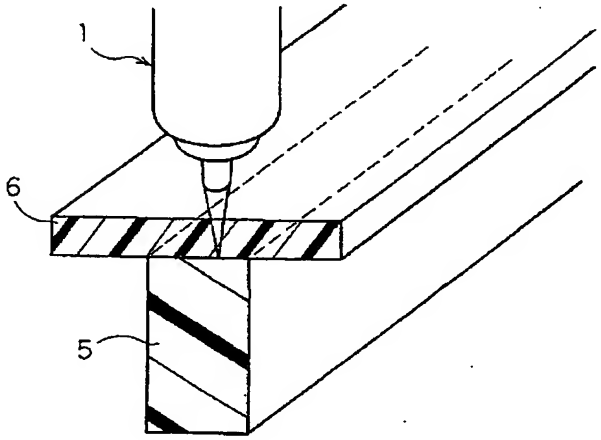
5　熱可塑性合成樹脂製部材（不透明部材）

6　熱可塑性合成樹脂製部材（透明部材）

【図１】



【図２】



【図３】